KARST AND GROUNDWATER IN NORTHEASTERN COAHUILA: AN EDWARDS AQUIFER MIRROR

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Abstract

The northeastern corner of the Mexican state of Coahuila contains some of the most extensive limestone outcrops in the country, yet the karst and groundwater have seen relatively little investigation. The western (recharge) portion of the area contains ridge tops of Lower Cretaceous rocks over 1500 m in elevation, which slope down to the east and south to plunge underneath less karstic Upper Cretaceous outcrops. This represents a confined aquifer zone where wells can flow under artesian pressure. In this respect it resembles the Edwards Aquifer across the Rio Grande in Texas, with similar carbonate lithologies and karst components.

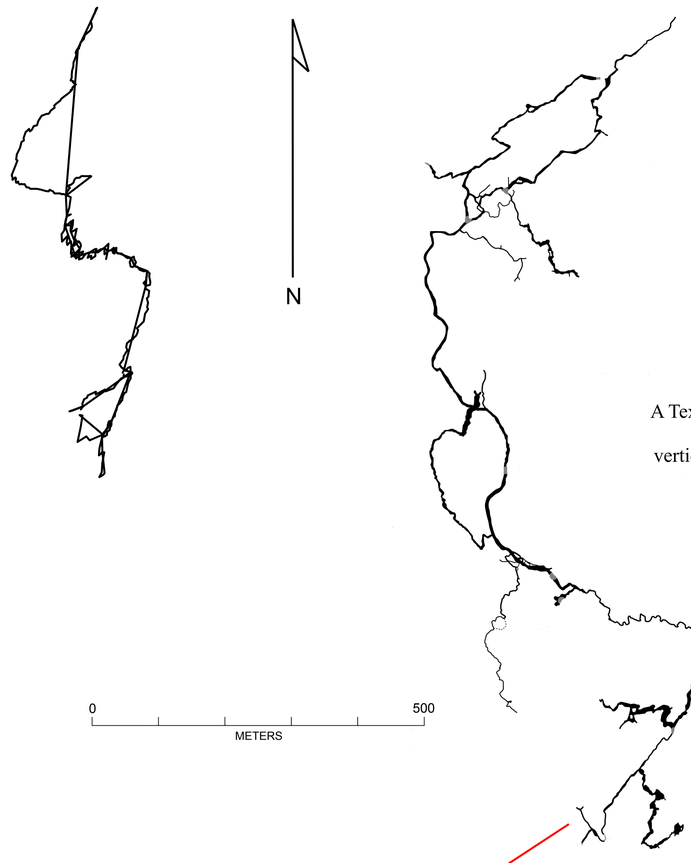
Over 60 caves have been explored in the area, most since the year 2000. Upland portions of the recharge zone contain vertical caves that likely contribute to aquifer recharge, although numerous seep-spring caves in canyon walls disgorge some water prematurely. The canyons themselves are major rechargers, exemplified by El Abra, a horizontal stream cave that is the longest in Coahuila at 1841 m in length. In the lower part of the recharge zone close to the artesian zone, there are a number of caves which are estavelles. These have large funnel-shaped sinkhole entrances that slope down to pits, dropping up to 90 m to flowing streams. These normally take water, but during times of heavy rains in the recharge zone they can become springs.

International Karst Analogs

Coahuila

El Abra

The entrance to El Abra is in a canyon floor at the top of the Glen Rose Formation. Water pours into this entrance during wet periods, and also comes in from a sump just below the shallow entrance pit from an unknown source. This stream flows at a gentle gradient through the main route of the cave to a sump.

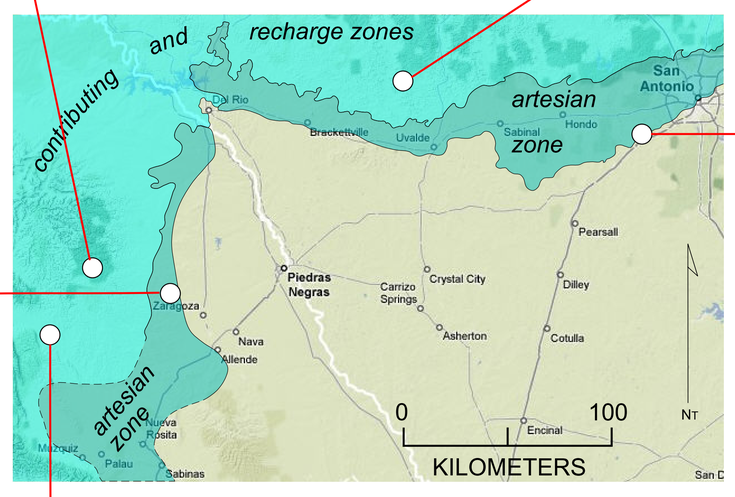


Texas

Indian Creek Cave

A Texas analog for El Abra is 5650-meter-long Indian Creek Cave in Uvalde County. It also sinks in the bed of a canyon at the top of the Glen Rose Formation, and after an initial vertical drop it is a horizontal stream passage that meanders underneath the surface canyon.

Artesian well at Rancho Veinticuatro, municipality of Zaragoza, Coahuila. Less permeable rocks at the surface confine water which can flow out under pressure when a well is drilled.



Map of the Edwards and Trinity-Edwards aquifers in Coahuila and Texas. The international border follows the Rio Grande (Rio Bravo) which divides the two artesian zones at Del Rio. Adapted from a map by Radu Boghici (2004), Hydrogeology of the Trinity-Edwards aquifer of Texas and Coahuila in the border region, in Mace et al (eds.), Aquifers of the Edwards Plateau Conference proceedings, Texas Water Development Board, Austin, TX.

Artesian well near Atascosa, Texas, releasing water from under confining rock units.

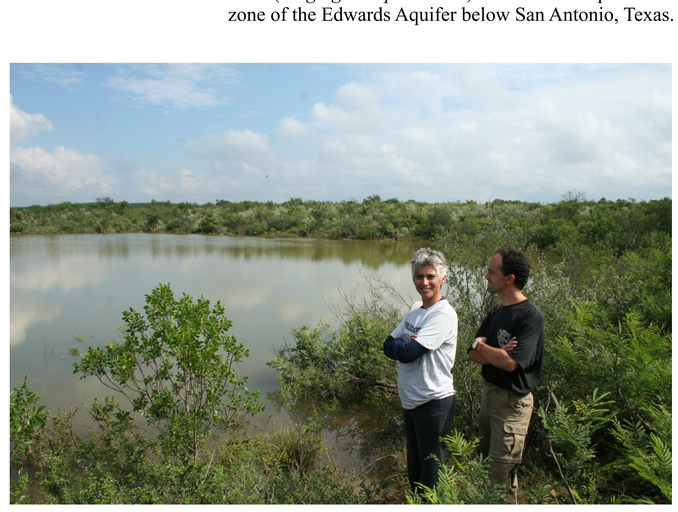
The Mexican Blindcat (*Prietella phreatophila*) can be found in the vadose and upper phreatic zones of caves in northeast Coahuila.

The Toothless Blindcat (*Trogloglanis pattersoni*) lives in the deep artesian zone of the Edwards Aquifer below San Antonio, Texas.

The 90 m entrance drop to Hundido del Mulato in normal conditions.

Estavelles

Hundido del Mulato is a large diameter pit that drops 90 m to a streamway, with further drops in the downstream direction toward the aquifer. It is situated in an isolated outcrop of the Buda Limestone surrounded by alluvium. Normally local drainage would enter the pit, but high aquifer levels can cause water to come out of it, making this an estavelle. During regional flooding in August 2008, water flowed out of this pit, forming a large lake with a raised fountainhead, evidence of significant hydraulic head originating in the Sierra del Burro to the north. There is no Texas analog for this site.



Hundido del Mulato full of artesian floodwaters.