

# Field Research in Tamaulipas, Mexico, Works to Develop New Methods of Aquifer Mapping

by Marcus Gary

At the base of the Sierra de Tamaulipas in northeastern Mexico, possibly the deepest water-filled pit in the world, known as El Zacatón, has developed in Cretaceous carbonates next to a Pleistocene volcanic extrusion. A team of devoted cave-diving pioneers has been exploring this hydrothermal karst system for over 10 years, and even set a world record deep dive in 1994 when Jim Bowden, a University of Texas SCUBA diving instructor, dropped to nearly 1,000 feet below the water's surface. Marcus Gary, a team member for the deep effort and current graduate student in the Jackson School of Geosciences, was inspired by the unique hydrogeology of this amazing area and now strives to understand the geologic processes that formed such massive windows into the Earth's subsurface.

In January 2002, a group of explorers and scientists, including Jim Bowden and Marcus Gary as well as University of Texas geology professors Jack Sharp and Mark Helper, began mapping the sinkholes and caves of the area using state-of-the-art technology. We first had to survey the perimeter of each of the sinkholes. This was not as easy as one might think. The Sierra de Tamaulipas is known for its harsh vegetation, appropriately termed "Tamaulipas Thorn Forest."



**TOP:** Team members survey the edge of El Zacatón. The water here is at least 1,100 feet deep, but the bottom has not been located yet. Round floating grass islands move freely about on the water surface. Photo by Mark Helper.

**BOTTOM:** Marcus Gary explains the geologic history of the karst aquifer to his advisor, Jack Sharp. Photo by Robin Havens.

Almost every tree, shrub, and plant has some sort of prickly that can puncture the skin or create some sort of dermal reaction that is more than unpleasant. To complete the survey, areas were cleared of vegetation using machetes and saws. We all received our fair share of blisters. One other drawback of working in this area is the infestation of ticks. It was not uncommon for each of us to pull dozens off every day. But even with the less appealing qualities of this place, it is still very beautiful and mysterious.

Our camp is around the 350-foot-deep thermal pool (water is a pleasant 90 degrees Fahrenheit) called La Pilita. Here, unique biological mats coat the underwater walls of the sinkhole and possibly host sulfur-based ecosystems that could provide answers

to how life evolves in extreme environments. We spend the evenings going over the data collected that day and discuss theories as to how the sinkholes formed. Since this is only the first year of study here, there are many more questions than answers to explain the unique nature of El Zacatón and the surrounding aquifer. Many years of exciting research at The University of Texas are planned to help us understand this incredible system.