

# ZACATÓN UPDATE

Marcus Gary

Two recent expeditions have collected data that will be used to interpret the geologic and hydrologic processes that formed the sinkholes in the large karst system that includes water-filled El Zacatón, plumbed to 329 meters deep.

In January 2002, Marcus Gary, Robin Havens, Bill Stone, Jim Bowden, Ann Kristovich, Jack Sharp, and Mark Helper spent two weeks working on Rancho La Azufrosa, the cattle ranch where Zacatón is located. Robin, Jim, and Ann spent much of the time working on cave-diving techniques and training. Marcus, Bill, Jack, and Mark spent the entire time conducting a detailed survey of the topography

around the pozas on the ranch (see *AMCS Activities Newsletter 24*). The goal of this survey is to produce a high-resolution three-dimensional image of the area, both above and, eventually, below water level.

In order to create images of the pozas above the water level, a laser radar, or LADAR, was used to scan the walls and surroundings. The first step was to clear the dense Tamau-

lipan thorn forest from several areas around the edge of the poza to give the LADAR a clear view. Once areas were cleared, benchmarks were drilled into bedrock, and a surveyor's total station was used to tie their locations together. Finally, each poza was scanned with the LADAR instrument from the several clearings in order to obtain data from enough angles to make a

This is an image of a room in Cavernas Cuarteles at a junction of three horizontal passages and several skylights. It represents a LADAR scan 360 degrees around (the left and right edges of the picture match up) and vertically from straight up to 45 degrees below horizontal. The data set consists of 750 points for each of 2000 vertical scan lines, giving a total of one and a half million data points. At each point, the instrument recorded both range, to plus or minus 15 millimeters, and the intensity of the reflection. The picture is made from the intensity data, which most closely imitates what a flash photo would look like. It is possible to drive 150 meters into the cave, and a truck is visible in the left-most passage. The small picture shows a blowup of the truck, demonstrating the resolution of the data. *Bill Stone.*



complete three-dimensional image. For each scan, a generator, power cords, the LADAR device, two tripods, and a laptop computer had to be hauled through the brush. Heat and rain caused some difficulties with the electronics; the computer had to be placed on an ice chest to keep it from overheating. El Zacatón, Poza Caracol, Poza La Pilita, and La Azufrosa were scanned during the expedition. We did not have time for Poza Verde because of the amount of chopping that would have been required.

We also completed a scan of a room in Cavernas Cuarteles, a dry cave. This produced a file of over a million and a half points that can be used to produce an extremely

high resolution cave map.

In March, a second expedition collected water samples from pozas in the area and explored previously unvisited sinkholes. Marcus Gary, Robin Havens, Jim Bowden, Ann Kristovich, Karen Hohle, and Alan Riggs spent a week diving and collecting data. The large Poza Tule was reached by much chopping through high reeds, only to discover that the water there is only 1 meter deep. We identified many other locations that need further study.



Marcus Gary with the laser scanner in place in Cuarteles. The large root at left, the rubble heap below a skylight, and the skylight at center are conspicuous in the middle of the panorama. *Bill Stone.*

Se reportan los últimos estudios realizados en los cenotes del Rancho La Azufrosa, Tamaulipas. Se utilizó un radar laser (LADAR) para elaborar un mapa tridimensional detallado de las porciones no sumergidas de varios de los cenotes, así como de un salón en la Cueva Cuarteles. La figura muestra un panorama del salón en Cuarteles, basado en la intensidad del eco del rayo laser a 1.5 millones de puntos. Se tomaron datos de química de las aguas y muestras de las cubiertas de algas que cubren las paredes de algunos de los cenotes. También se alcanzó por tierra la Poza Tule, que parecía muy prometedora desde el aire, pero la profundidad máxima del agua no fue superior a 1 metro.