

NATURAL BRIDGE CAVERNS: UNIQUE VIEWS THROUGH TIME AND SPACE INSIDE AN AQUIFER

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Overview

Caves are unique and fragile natural resources that may contain records of archeological, paleontological, and paleoenvironmental change. Caves provide an especially useful window to the inside of aquifers, where a range of hydrogeologic processes can be studied so that water-resource use and management can be better planned. Caves also provide habitat for unique and endangered species. Calcite mineral formations in caves, called speleothems (e.g., stalactites and stalagmites) preserve records of Earth history. Beyond humankind's record keeping, which is very recent, scientists must use archives of information found in Earth materials that may record how variables such as climate have changed. Such records help us understand the history of the Earth and how conditions may change in the future.

Karst aquifer

Karst is a unique type of landscape that forms from the chemical solution of bedrock in limestone terrains. An aquifer is a body of rock that is permeable enough to bear water. Karst aquifers are distinctive because as limestones dissolve, heterogeneous and large underground water-flow pathways are created. These features make karst aquifers important water resources (providing water to about 25% of the world's population). At the same time, these features also make karst aquifers complex, highly variable in time and space (with respect to water availability), and more susceptible to groundwater contamination.

Natural Bridge Caverns—Geologic Setting and Processes of Formation

Rock formations of the Edwards and Glen Rose (figs. 2 and 3) are layers of limestone that formed from warm, tropical waters in the ancestral Gulf of Mexico approximately 100 million years ago during the Cretaceous Period. At that time, Earth's climate was warmer, and sea level was much higher than today's. After sea level lowered, Natural Bridge Caverns (Stop 4 on figs. 1 and 12) was formed over millions of years by the dissolving action of rain water infiltrating through the soil into underlying limestone. Carbon dioxide (CO₂) created in soils from degrading organic matter plays an important role in limestone dissolution and cave formation. Speleothems formed from water dripping into the caverns, and some continue to grow today.

Tour highlights

The tour through Natural Bridge Caverns will focus on insights from cave waters and speleothems concerning water quality and quantity. We will discuss how natural chemical tracers can be used to understand (1) the control of soils on water quality, (2) different flow paths that water takes through the aquifer, and (3) the influence of climate on recharge. Formation of speleothems will be considered, including precise dating of their growth layers and their utility in reconstructing long-term records of recharge to the Edwards aquifer.