Caves in Missouri

Missouri has more than 7,000 recorded caves (Missouri Speleological Society 2016), consequently it is widely known as the Cave State. A cave is a natural underground opening large enough to explore. It may be a rock shelter, a pit opening in the bottom of a sinkhole, or a many-roomed passage that extends deep into the Earth.

Missouri caves are solution caves. Such caves are created over a long period of time when groundwater dissolves enough rock to widen the surface that separates each successive layer of stratified rock from its preceding layer in limestone or dolomite. Most caves in the state are found south of the Missouri River in the karst topography of the Ozark region but a few significant karst areas extend north of the river, mostly in Boone County and counties bordering the Mississippi River downstream near Palmyra.

Importance of Caves

Caves are important natural resources because of their unique beauty, their history, and their role in a healthy environment. They play key roles in groundwater movement, serve as habitat for threatened and endangered animal species, and often yield the bones of prehistoric animals as well as the artifacts of prehistoric man. They provide outstanding opportunities for studying and gaining a better understanding of the geology of Missouri’s landscape, and the relationships between the environment we see at the surface and the one that is hidden underground.

Caves have been used for roughly 10,000 years by Native Americans in Missouri. These early Missouri residents used caves as shelters, sources of water, and as a source of clay and other materials. Early settlers in Missouri used caves as spring houses, barns, and beer and wine cellars because they have a natural temperature range of 52 to 60 degrees throughout the year. In the 1880’s, after Mark Twain popularized a Missouri cave in his book “The Adventures of Tom Sawyer”, people came from around the world to see the cave the author had written about. Thus began a new industry, cave tourism.

Today, caves are used mainly for scientific research and recreation. Researchers study the underground movement of water through caves to help prevent groundwater wells from becoming polluted. Animals found deep in caves are studied to see how they survive with so little food and no light. Rare and endangered cave animals are studied and protected. Some caves, such as Graham Cave State Park, provide researchers the opportunity to uncover artifacts and other evidence that provide clues to aspects of the daily life of early Native Americans that inhabited them. Caves also provide an opportunity to study fossils and tracks left behind by animals that used them in the past.
How Caves are Formed

Caves can be formed in any type of rock; either igneous, sedimentary or metamorphic. However, when most people think of a cave, they think of one formed by chemical solution in carbonate rock. Limestone and dolomite, forms of sedimentary rock, are the most common carbonate rocks that form solution caves.

When the bedrock is highly fractured, or the beds of rock tilted due to uneven uplift, karst topography often results. Water very easily penetrates the rock under these conditions. The protective layer of soil and clay is thin and more easily washed away, leaving more rock to erode.

Carbonate caves are formed by processes both inside and outside the earth. Initially rain on the surface of the land enters the ground after having picked up dissolved carbon dioxide gas from the atmosphere and decaying plant matter in the soil. This water reacts with the carbon dioxide to form a weak carbonic acid solution. Carbonic acid (which is the same thing that gives soda pop its fizz) will dissolve calcium carbonate from limestone and dolomite, forming a solution of calcium bicarbonate in water.

This process actually dissolves the rock, forming cave passages over hundreds of thousands to millions of years. At this point, the cave is water filled, without an opening. This charged water moving through the rock also scours the walls of the passage, so the making of cave passages is partially chemical and partially mechanical. Changing water temperatures and amounts of chemical in solution sometimes causes calcium carbonate to fall out of the solution, or precipitate while the cave is still water filled. Clay can accumulate if the water is not flowing fast enough.

While the underground passage is growing larger, the surface above is continuing to erode, lowering the water table, and allowing air into the cave. Soon the cave becomes partially air filled. When this happens, some of the dissolved carbon dioxide escapes and changes the acidity of the water, the calcium carbonate comes out of the solution, and is deposited as crystallized calcite or speleothems (cave deposits such as stalactites, stalagmites, columns and soda straws).

Erosion continues and surface streams cut their valleys. Joints intersecting the surface enlarge, forming sinkholes. The general level of the land lowers until either a down cutting stream or a sinkhole intersects the cave stream, forming a spring or a karst window and further draining the cave.
Caves are Ever Changing

A cave is a changing environment. Many people consider caves and springs to be two different features, but springs are just caves that contain water. Most Missouri caves are wet, with permanent cave streams. Some are still enlarging their passages, and most are still depositing speleothems. Caves may have portions which are still underwater and streams that originate far away. Some cave systems have sections which are "dead" and are no longer enlarging or growing speleothems.

The final stage of a cave is collapse. Eventually, the roof will get thinner and thinner and fall in, exposing the cave. A good example of this is at Grand Gulf State Park, where a cave is now a huge sinkhole with minor caves, which were once side passages.
Glossary of Terms

**Carbonate rocks:** A class of sedimentary rocks composed primarily of carbonate minerals. The two major types are limestone and dolomite. Karst topography and caves develop in carbonate rocks because of their solubility in dilute acidic groundwater.

**Column:** A cave formation that reaches from the floor to the ceiling of a cave.

**Igneous:** Rock produced under conditions involving intense heat, of volcanic origin or crystallized from molten magma.

**Karst window:** A depression revealing a part of a subterranean stream flowing across its floor, or an unroofed part of a cave.

**Metamorphic:** A rock that has been changed from its original form after having been subjected to heat and/or pressure.

**Sedimentary:** Rock that has formed through the deposition and solidification of sediment, especially sediment transported by water, ice, and wind. Sedimentary rocks are often deposited in layers, and frequently contain fossils. Limestone and dolomite are common sedimentary rocks.

**Soda straws:** A thin tubular stalactite, generally less than a centimeter in diameter.

**Solution caves:** Caves that are formed by the dissolving of soluble rock, such as dolomite or limestone, by slightly acidic water.

**Speleothem:** A secondary mineral deposit formed in a cave.

**Spring:** A natural discharge of groundwater at the land's surface.

**Stalactite:** A deposit that is formed inside of a cave as water drips and leaves minerals behind. These hang from the ceiling.

**Stalagmite:** A deposit that is formed inside a cave as water drips and splashes on the cave floor and leaves minerals behind. These grow on the cave floor upward.

**Stratified rock:** Rock that has been formed by compaction, cementation, or crystallization of successive beds of deposited material.

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