

Caves in Illinois: Our subterranean landscape

What is a cave?

Simply defined, a cave is a natural underground opening or cavity in rock that is large enough for a person to enter; however, the term cave has many definitions. For purposes of this Geobit, we do not include shallow indentations in cliff faces (rock shelters) and specify that a cave must be deep enough for a person to experience total darkness. A cave is one of the few ways a person can enter the Earth's interior and experience, first hand, the processes that take place there. Surprisingly, the subsurface is alive with the sights, sounds, and smells of dripping and rushing water, "breathing" passages, unusual rock formations, and equally unusual animals, insects, and microscopic life. A cave is a living, but alien environment where humans are only transient visitors.

Cave passages can range from narrow crevices to tubular conduits; they can be barely large enough to squeeze into or large enough to drive a semi-trailer truck through. Caves can be dry or totally filled with water; but typically in Illinois, there is enough groundwater and surface water seeping into them to form a small stream at the bottom of the passage.

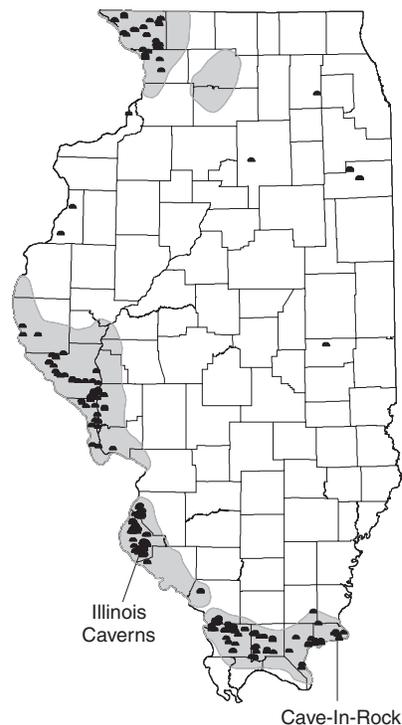
What makes a cave?

Certain conditions are necessary for the formation of a cave. They include

- a relatively thick deposit of soluble rocks, such as limestone or dolomite
- near-vertical fractures and/or near-horizontal bedding-plane fractures large enough for surface water or soil water to enter
- the infiltration of slightly acidic water to dissolve bedrock
- a path for water to flow along and eventually exit the fractures and/or bedding planes
- a slope within the fractures and/or bedding planes that allows water to flow from points of entrance (such as sinkholes) to points of exit (typically springs)

Such conditions for cave development occur in the karst regions of Illinois along the margins of the Illinois Basin. Rainwater, snow melt, and soil water seep into fractures and along bedding planes in the bedrock. The water flows through these small cavities in the bedrock to the underlying aquifer and/or to points where the water discharges to surface streams.

Water that seeps into a cave can be slightly acidic as a result of its interacting with atmospheric carbon dioxide or entering the soil zone, where the water dissolves biologically derived carbon dioxide. The carbon dioxide forms carbonic acid with the water that is capable of dissolving the minerals that make up limestone and dolomite. The carbonic acid-enriched rainwater, snow melt, and soil water dissolves the limestone and dolomite, enlarging crevices and caves. As water flows through the rock, fractures are widened to form larger fissures; water can also create small, tubular conduits along the bedding planes



Karst regions of Illinois (gray) and the approximate locations of the more than 300 caves in Illinois. Sinkholes, circular depressions, caves, and numerous openings characterize karst landscapes.

between layers of rock. Gradually enlarged over the course of tens to hundreds of thousands of years, the water pathways eventually become large enough for people to enter and are then referred to as caves.

If water in the soil zone interacts with limestone or dolomite prior to entering a cave, it dissolves the carbonate minerals and becomes slightly alkaline. In the cave passage, the pressure is lower than in the soil zone, and carbon dioxide comes out of the groundwater like the effervescence from a freshly opened bottle of soda pop (although not as dramatically). With the loss of carbon dioxide, the water becomes too alkaline to hold all the minerals that it dissolved in the soil zone, and carbonate minerals (such as calcite) are slowly deposited as stalactites, stalagmites, and flowstone within the cave. Thus, the rocks in a cave can be dissolving and being deposited within a few feet of each other.

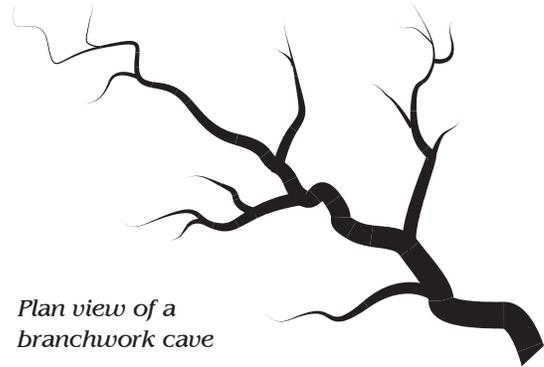
Types of Illinois caves

More than 300 caves have been identified in Illinois. Most are one of two types, branchwork or network caves, depending on how water moves into and through the subsurface.

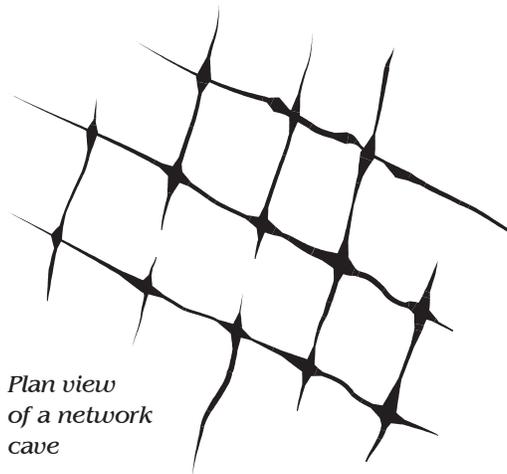
Branchwork caves, most often found in limestone deposited during the Mississippian period (355 to 325 million years ago) in the southern half of the state, consist of a dendritic (or tree-like) pattern of passages. That is, smaller passages merge into a single, larger trunk passage that carries water to a spring, generally at a low-lying area at the surface. Branchwork caves form where surface water and soil

water enter the subsurface through near-vertical fissures in the bedrock and enter near-horizontal bedding planes of layered limestone. The side passages merge into progressively larger passages or downstream

conduits for the infiltrating surface drainage. Illinois Caverns near Waterloo, IL, is a classic example of a branchwork cave.



Plan view of a branchwork cave



Plan view of a network cave

Network caves are typical of those formed in the northern half of Illinois in rocks of the Silurian system (deposited 445 to 415 million years ago) that are composed mostly of dolomite. Network caves are also common in the southern part of Illinois. These caves are formed where surface water and soil water enter fractured limestone or dolomite bedrock. The incoming water dissolves and widens pathways along the major fractures in the carbonate rock. The bedrock fissures act as conduits for infiltrating water to migrate deeper into bedrock or to lower elevations where the water may discharge to the surface as a spring. The passages are typically grid-like in their distribution with tall, narrow passages and sharp, angular intersections.

Cave ecosystems

Illinois caves provide a unique habitat for numerous unusual organisms, including bats, salamanders, fish, the near-microscopic, pillbug-like creatures called isopods, the shrimp-like creatures called amphipods, fungi, and microscopic bacteria. Organisms in this environment are adapted to total darkness, constant dampness, and, for some caves, seasonal flooding.

Twelve species of bats are found in Illinois caves. Bats are the only mammals capable of flying. They leave the caves only at night and use a form of echolocation (high-frequency sound waves) to navigate; each bat can eat up to 3,000 insects a night.





Stalactites (on ceiling) and stalagmites (on floor) in Illinois Caverns grow because they are continuously bathed in calcium carbonate-rich alkaline water slowly dripping or, in some cases, rapidly flowing from the ceiling.



Conservation of cave environments

Valuable natural resources, caves are threatened by poor conservation practices. If you visit caves, please do not disturb their natural state. Leave their beauty for future visitors and future generations. Do not touch the delicate formations. Stalactites and stalagmites take tens of thousands of years to grow and cannot be replaced. The oil on your hand prevents the formations from growing. Do not bother the inhabitants, and do not smoke in the cave. Preserve the wild nature of these caves by collecting and removing your trash and trash left by others.

Illinois caves you can visit

Most caves in Illinois are privately owned, and anyone interested in visiting such caves is legally required to get permission to enter. Two state-owned caves are open to the public throughout the year: Illinois Caverns and Cave-in-Rock.

Illinois Caverns, the second largest cave in Illinois, is located in Monroe County near the town of Waterloo and is a state natural area. A branch-work cave, it has 6 miles of explorable passages cut through bedded limestone. Passages can be up to 20 feet high and almost as wide. The cave is well decorated with water-deposited calcite (flow-stone, stalactites, and stalagmites) and has a small stream flowing through the main passage. Bats, salamanders, frogs, crickets, amphipods, and isopods make this cave their home. At least one of the inhabitants is a federally endangered species, and none of the wildlife should be touched. The cave is open all year, and exploration is self-guided. All you need are at least four people, three flashlights per person (it is dark), a hard hat (the ceiling is low in some areas), and hiking boots (the floor is notoriously slippery). Expect to get wet. A map of the cave is available from the site interpreter.



Cave passages may be large and extensive and are created by flowing water that dissolves the rock. The bedded nature of rock is apparent in the ceiling and walls of this side passage in Illinois Caverns.

Cave-in-Rock is located at Cave-in-Rock State Park in Hardin County. This cave is a large conduit that is open along a bluff overlooking the Ohio River; the entrance is about 20 feet wide and 30 feet high. The cave is about 150 feet deep, and in the ceiling near the end of the single, large passage, a small hole that leads to the ground surface a short distance above admits just enough light to prevent total darkness. Although dry most of the year, the cave is periodically flooded by the Ohio River. The site has historic significance because it was used by river pirates as a hideout. Exploration is self-guided. Unlike Illinois Caverns, Cave-in-Rock has few wildlife inhabitants.

Visiting caves—Caution!

Caves are interesting and beautiful, but beware—caves are dangerous. They are dark, sharp angular rocks often lurk about at head level, and footing is slippery. Drops of a few feet to tens of feet may surprise the unwary explorer. Heavy-soled boots, hard hats, warm clothing, knee pads, and at least three sources of light (with spare batteries) per person are recommended. Because surface-derived contaminants wash into caves so easily, cave water commonly has high concentrations of bacteria. Do not drink the water and do not expose open cuts to the water. One of the most dangerous times to go into a cave is just before, during, or immediately following rainfall. Caves often act as natural drains that collect runoff from rain storms and snow melt, and many caves in Illinois rapidly and completely fill with water (flash floods) as a result of large storms. In addition, tell a responsible person where you are going and when you plan to return. If you obtain permission to enter a privately owned cave, check in with the owner when you enter and leave the property. In the event you become lost or your lights go out while in the cave, it is best to stay in one place (preferably a dry place) and wait to be rescued. The best way to learn about caving is to contact the National Speleological Society (NSS) at 2813 Cave Avenue, Huntsville, AL 34810-4431, or by e-mail at nss@caves.org. Many local NSS chapters (called grottos) can be accessed at www.caves.org/defaultjs.htm.



A sinuous stream channel in Illinois Caverns. This channel is being cut (dissolved) into limestone by the flowing water.

Contributed by S.V. Panno and C.P. Weibel

Recommended reading

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